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A SYNOPSIS OF THE CICADIDÆ OF MISSOURI (HOMOPTERA)

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This study was undertaken to clarify the status of Missouri members of the family Cicadidæ so that the state list of insects might be more accurate; to furnish local workers with a convenient means of identifying their Missouri specimens; and to call attention to the possibility of separating at least some of the genera by characters which work with either sex.

In the literature fifteen species have been credited to the state. Of these, three apparently do not belong to the local fauna. *Okanagana rimosa*, which was described in part from "Missouri" as *Cicada rimosa* by Say in 1830, is deleted because Davis (1919) concluded that the specimens were actually taken in one of the Dakotas which were included in the old "Missouri Territory." This species, therefore, cannot be claimed for the local fauna on Say's record. Since it seems to be a more northern form and as we have seen no local specimens, it probably does not belong to the Missouri list.

Although Uhler (1892) listed "*Cicada canicularis* Harris"—now *Tibicen canicularis* (Harris)—for Missouri it apparently does not belong to the state's fauna. We have seen no state specimens and Davis (1930) wrote that this species ranges from "Nova Scotia to Manitoba and the mountains of Colorado and thus seems to have a wide distribution in the north." On the basis of this more northern range and the lack of specimens we are dropping *canicularis* from our list of Missouri insects.

In 1905 Uhler recorded "*Cicada grossa* Fab." from "Southern Missouri." Under this name he is known to have confused at least two of the large species of *Tibicen*, namely *auletes* and *marginalis*. This confusion of forms plus the fact that true *grossa* was described from "Brazil" makes it necessary to exclude this name from our Missouri list.

To the remaining twelve species we add two more names bringing our total of valid forms to fourteen. General recorded distributions indicate that three others are of likely occurrence. Seventeen species are therefore included in this paper.

The author is deeply grateful for additional records from the institutional collections of the University of Missouri (Dr. L. Haseman), the St. Joseph Museum (Dr. R. E. Coy) and the Academy of Science of St. Louis; and from the private cabinets of W. S. Craig, W. R. Enns, H. I. O'Byrne, E. P. Meiners and H. I. Rainwater. Records which the author did not personally collect are indicated by the initials of their collectors as follows: C. F. Adams, C. L. Heink, C. W. Wingo, H. I. O'Byrne, H. I. Rainwater, L. Haseman, R. E. Coy, S. Sparling, T. E. Birkett, W. K. Clark and W. S. Craig. Indebtedness extends further to Dr. M. Cazier of the American Museum of Natural History and to Dr. R. J. O'Connor for generous loans of material of *Tibicen robinsoniana* Davis for study.

Illustrations for this paper are all original by Elsie Herbold Froeschner.

KEYS TO THE MISSOURI GENERA AND SPECIES OF CICADIDÆ

1. Veins M and Cu at base of forewing leaving areculus separately (Fig. B.) 2

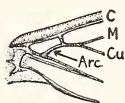


FIG. A

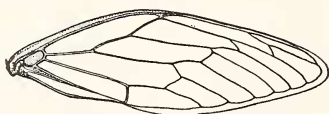


FIG. B



FIG. C

(key structures)

Fig. A. base of forewing of *Melampsalta calliope*

Fig. B. forewing of *Tibicen linnei*

Fig. C. tip of forewing of *Diceroprocta vitripennis*

Veins M and Cu at base of forewing united for a short distance and leaving the arculus as a single vein (Fig. A.)

VI. *Melampsalta*

2. (1). Pronotum laterally with prominent longitudinal carina for nearly or quite its entire length; hind collar of pronotum may project laterally 3

Pronotum with sides rounding regularly into dorsal disk, without longitudinal carina laterally; hind collar of pronotum projecting abruptly outwards at sides V. *Magicicada*

3. (2). Abdomen translucent; carinate edge of pronotum evanescent anteriorly; longitudinal veins of front wings each with a distinct brown cloud apically I. *Cicada*

Abdomen opaque; carinate edge of pronotum reaching anterior margin; longitudinal veins not clouded at apices 4

4. (3). Humeral angle of pronotum not expanded as a prominent, subquadrate lobe; head at least as wide as front margin of pronotum 5

Humeral angle of pronotum produced as a prominent, subquadrate lobe; head not as wide as front margin of pronotum

IV. *Okanagana*

5. (4). Front wings with anterior two cross veins strongly oblique (about 45°), the front one placed distinctly before the middle of the cell anterior to it (Fig. B.) II. *Tibicen*

Front wings with anterior two cross veins more nearly vertical, the front one placed just about at the middle of the cells anterior and posterior to it (Fig. C.) III. *Diceroprocta*

I. *Cicada* Linnæus

1. Straw yellow; head, pronotum and mesonotum strongly and intricately marked with black, and usually lightly washed with green; length 20-25 mm. (Fig. 4) *hieroglyphica* Say

II. *Tibicen* Latreille

1. Hind collar of pronotum nearly or quite wholly black 2
Hind collar of pronotum almost wholly pale, occasionally blackened anteriorly 3

2. (1). Color fulvous and black; mesonotum fulvous, black occupying central area and irregular lines at margins; abdominal sternites with a wide, polished black median vitta; length 31-34 mm. 2. *lyricen* (DeG.)

Color green and black; mesonotum black with narrow pale lines and spots; abdominal sternites without or with only a very narrow black vitta; length 32-36 mm. 3. *chloromera* (Wlk.)

3. (1). Apical third of front wing distinctly infuscated; color, including abdomen, chiefly greenish buff with few black marks on mesonotum; length 30-33 mm. 13. *superba* (Fitch)

- Apex of front wing not infuscated, except sometimes by a small cloud over each of the anterior two cross veins; abdomen always dark brown to black4
4. (3). Abdominal segments above with posterior margins or more brown5
- Abdominal segments above not paler on posterior margins, sometimes with pruinose white markings6
5. (4). Anterior two cross veins covered by distinct brownish clouds; brown of abdominal tergites extensive, not confined to hind margins of segments; length 32-35 mm.12. *resh* (Hald.)
- Anterior two cross veins without surrounding brown clouds; brown of abdominal tergites confined to hind margins of segments; length 35-40 mm.6. *marginalis* (Wlk.)
6. (4). Size larger, front wings at least 50 mm. in length.7
- Size smaller, front wings less than 50 mm. long.8
7. (6). Mesonotum ferruginous, marked with black as follows: elongate spot either side of middle anteriorly, a small spot laterad of these, a spot on each side margin and a large transverse spot posteriorly which has a narrow point extending forward along the middle line; length 38-40 mm.4. *resonans* (Wlk.)
- Mesonotum black with lateral margins and anterior inverted V-shaped mark fulvous, latter broadened and extended posteriorly to reach pale cruciform elevation; length 40-42 mm.5. *auletes* (Germ.)
8. (6). Abdomen without a median row or pruinose white spots above9
- Abdomen with a median row of pruinose white spots above; marks on mesonotum, entire side margins of abdomen and band across pregenital segment white pruinose; length 31-38 mm.11. *dorsata* (Say)
9. (8). Size small, length of body 23-26 mm; pronotum all green except for triangular black spot on anterior margin; abdomen beneath with hind margins of segments distinctly paler, sometimes covered with dense pruinosity7. *aurifera* (Say)
- Size larger, length of body at least 29 mm.10
10. (9). Costa of forewing obtusely bent near middle (Fig. B); lateral white marks on abdominal tergite I inconspicuous; length 30-33 mm.8. *linnei* (Sm. & Gross.)
- Costa of forewing not so bent (Fig. 5)11
11. (10). Under side of abdomen with broad, parallel-sided black stripe covering middle two-thirds or more of sternites; side margins of under side of abdomen also black; length 32-36 mm.10. *robinsoniana* Dav.
- Under side of abdomen with median stripe obsolete, when present not occupying more than middle third of sternites and conspicuously tapering posteriorly; abdomen beneath not blackened along side margins; length 29-35 mm.9. *pruinosa* (Say) (Fig. 5)

III. *Diceroprocta* Davis

1. Head with transverse black stripe reaching nearly or quite from eye to eye; membranous part of fore wings entirely (including basal cell) hyaline; length 20-23 mm.

14. *vitripennis* (Say) (Fig. 2)

IV. *Okanagana* Distant

1. Pronotal margin anterior to humeral projection yellowed; underside of abdomen, except sometimes base of first segment and subgenital plate, pale; pale color of mesonotum not forming a broad, continuous stripe either side of middle; length 19-20 mm.15. *balli* Davis (Fig. 6)

V. *Magivicada* Davis

1. Head, thorax and abdomen chiefly black; eyes red; legs and most of wing veins orange-red; anterior two cross veins and longitudinal vein between them strongly clouded; length 21-31 mm.16. *septendecim* (Linn.) (Fig. 3)
 - a). Abdomen conspicuously marked with pale brown, especially ventrally; size larger, 27-31 mm.
nominal *septendecim* (Linn.)
 Abdomen almost or quite wholly black ventrally; size smaller, 21-25 mm. variety *cassinii* (Fish.)

VI. *Melampsalta* Kolenati

1. Straw-yellow, males only with a few dark markings; wings wholly hyaline; length 12-16 mm.17. *calliope* (Wlk.) (Fig. 1)

NOTES ON MISSOURI CICADIDÆ

1. *Cicada hieroglyphica* Say. All our records are for the latter half of June. On one occasion this cicada was found very common and singing in midafternoon on the trunks of oak trees in an Ozark woods. In this instance the majority of specimens were less than seven feet up on the trees, with only an occasional one above fifteen feet. Davis (1924) published an interesting note concerning a Missouri specimen: "Lately Mr. A. E. Brower of Willard [Greene County], Missouri, sent me a male *Cicada hieroglyphica* and a *Polistes pallipes* wasp with the following memorandum: 'Heard the cicada feebly crying and found it upon the ground with the enclosed wasp feeding upon it, July 4, 1923.' The head and part of the pronotum of the cicada are gone, evidently eaten by the wasp." A year later (1925) he again listed it for the state. Dent and Scott counties.

2. *Tibicen lyricen* (DeG.). The few Missouri specimens studied were collected between July 13 and August 10 in Atchison, Cape Girardeau (WRE), Greene (HIR), Jackson, Oregon and St. Louis (EPM) (HIO) counties.

3. *Tibicen chloromera* (Wlk.). The several specimens collected by the author were found in decidedly moist situations—in willow shrubs along river banks—during July. Boyer and Heinze (1934) reported finding one of these insects in the stomach of a copperhead snake collected in Ste. Genevieve County on August 9. Cape Girardeau (CWW), Carter (EPM), Mississippi (WSC), St. Louis, Stoddard and Vernon counties.

4. *Tibicen resonans* (Wlk.). Since this southern species has been reported for Kansas there is some probability that it may be found in Missouri.

5. *Tibicen auletes* (Germ.). This, the largest cicada to be found in the United States, has been recorded from the state several times. Davis (1915), on the basis of some specimens collected in Wright County during August by M. P. Somes, listed it as *Cicada auletes*; later reports, under the present name, were given by VanDuzee (1917), Lawson (1920) and O'Byrne (1932). The latter wrote of a specimen in St. Louis County being attacked by the wasp *Polistes rubiginosus* Lepeletier on July 19. Studied material had been collected between August 1 and September 7. Boone, Cole (CFA), Crawford, Dade, Oregon (WKC) and St. Louis (HIO) counties.

6. *Tibicen marginalis* (Wlk.). This species was originally described by Thomas Say (1825) from "Missouri" as *Cicada marginata*, but as this name was preoccupied Walker changed it to *marginalis*. Under the generic name *Cicada*, Uhler (1892) recorded it for the state. Using the modern terminology Davis (1925 & 1935) listed it from the state, and with his description of the variety *pronotalis* (1938) he mentioned a few Missouri specimens. Except for a few individuals of the varietal form which were taken in Atchison and St. Louis counties during August, all our material is of the nominal form and was collected between July 27 and October 7. Gasconade, Jackson (HIR), Mississippi (WSC), Pemiscot, Pike (WSC), St. Louis and Taney counties.

7. *Tibicen resh* (Hald.). Davis (1918 & 1930) twice reported *resh* from the state; we have seen no local specimens.

8. *Tibicen aurifera* (Say). "*Cicada aurifera*" was described by Say (1825) with the remark, "Inhabits Missouri." We have seen a single male specimen which had been found dead in the Japanese beetle traps in St. Louis.

9. *Tibicen pruinosa* (Say). This is by far the most common of our cicadas or "locusts" as they are commonly called in the state. The number of individuals found coming to lights at night was most surprising. We have seen these night-flying individuals find their way into ice cream parlors and drug stores where their clumsy whirring flight frequently caused a mild panic among the patrons. Specimen records extended from June 21 to September 27, but we have "song" notes as late as October 11. One specimen from Livingston County has the lateral white pruinose spot of the third abdominal segment prolonged inwardly almost to the middle line of the abdomen. Except for this extended white mark and a narrow brown edge at the middle of the hind margin of the second segment it does not differ appreciably from normal specimens taken at the same locality. Davis (1915) recorded it from "Hollister [Taney County], Mo., (H. H. Knight)" as *Cicada pruinosa*; VanDuzee (1917) and Davis (1923) both gave local listings under the present name, the latter on the basis of a specimen collected in Greene County by A. E. Brower. Atchison, Boone, Buchanan (HIR), Cape Girardeau (CWW), Cole (CFA), DeKalb, Greene, Holt, Jackson (HIR), Livingston (SS), Mississippi (WSC), Nodaway, Pike (WSC), St. Charles and St. Louis counties.

10. *Tibicen robinsoniana* Davis. Although we have collected no material of this species, it belongs to the state's fauna as indicated by the literature records of Davis:—(1923) Hollister [Taney County], VII-22, 1915 (H. H. Knight); (1925) referring to the 1923 record; (1930) Forsyth [Taney County], September 4 (A. E. Brower); and (1932) Missouri. Through the extreme kindness of Dr. R. J. O'Conner, Curator of Science at the Staten Island Institute of Arts and Sciences, we were able to borrow and study the three specimens on which these records were based.

11. *Tibicen linnei* (S. & G.). We have two specimens—both females—which show the decided bend in the costa of the fore wing as figured by Davis (1918) and in the present paper (Fig. B). These had been taken in Boone and Crawford counties on September 10 and 7 respectively. Cuthbert and Cuthbert (1945) reported that a number of nymphs of this species had been eaten by a cat in Adair County on July 8.

12. *Tibicen dorsata* (Say). Beginning with Say's (1825) original locality citation, "Inhabits Missouri," we find a number of literature references to the local occurrence of this species: under the old generic assignment with *Cicada* there are records by Uhler (1892) and Davis (1915), the latter for "Mountain Grove, Wright Co., Mo., Aug. 4, 1902, male," and the same locality for a female in the collection of the Missouri Agricultural Experiment Station; VanDuzee (1917) and Lawson (1920) used the present terminology. At least in some localities in this state the species occurs in great abundance during August. We have collected it most commonly in open grass land and on sparsely weeded fields. Numerous freshly emerged and fully matured adults have been seen clinging to low growth (*Rhus* and *Solidago*) in such localities. An occasional individual has been found in clumps of trees which are often encountered in these prairie habitats. Atchison, Cass and Holt counties.

13. *Tibicen superba* (Fitch). This species has been listed for the neighboring states of Kansas, Oklahoma and Arkansas so we may expect to find it in at least the southwestern part of Missouri.

14. *Diceroprocta vitripennis* (Say). Besides Davis' (1928) listing we have specimen-records that were collected between June 24 and August 30 in Cole (LH), Mississippi (WSC) and St. Louis (PR) counties.

15. *Okanagana balli* Davis. This species is said by Davis to be "common in Iowa and neighboring states as far west as Kansas." We should, therefore, look for it in the northern part of our state.

16. *Magiccicada septendecim* (Linn.). The "periodical cicada" has probably excited as much interest in the non-entomological mind as any other species of insect. Even though so widely known, the exact status of the several names involved in treatments of this cicada is still uncertain. The questions involve

the possible specific distinctness of the northern seventeen and southern thirteen year forms, and the exact status of the dwarfed form *cassinii* (which occurs with both the thirteen and seventeen year forms) in relation to the nominal forms.

There are a number of literature references to this species' occurrence within our state, of which a partial list follows: as *Cicada septendecim* by Riley (1869, 1881 & 1885); as *Tibicina septendecim* by VanDuzee (1917), Lawson (1920) and Rau (1922); as *Tibicen septendecim* by Marlatt (1907); as *Tibicina cassinii* (Fisher) by Davis (1919a); and as *Magicicada cassinii* by Davis (1925) from Clark County on October 15, 1919, this being an exceptionally late seasonal record, adults usually having disappeared by midsummer.

In 1915 Dr. L. Haseman published a bulletin entitled, "The Periodical Cicada in Missouri," in which he gave a synoptic report of the species as it was known to occur within the state up to that time. Most of the following distributional data is gleaned from that study. The average period of adult appearance is from late May until late June or early July. Eight broods have been reported for the state, two of which are of doubtful occurrence (Brood XVII and XXX).

Missouri Broods of *M. septendecim*

Brood No.	Distrib. in State	Scheduled Appearances	
		Last	Next
III	northern & western	1946	1963
IV	northern & western	1947	1964
X	all but northwestern third	1936	1953
XVII	western third	1950	1967
13 Year Races			
XIX	all but northwest corner	1946	1959
XXIII	widely but scattered	1950	1963
XXIV	southeast lowlands	1938	1951
XXX	Cass County only	1944	1957

The Periodical Cicada has been reported for 110 of the 114 counties of the state (all except Nodaway, Platte, Wayne and

Worth counties). The following list of counties and broods reported to have occurred in them is based chiefly on Haseman's 1915 paper with additions from Haseman (1919) and Hyslop (1935), and specimen records enclosed within brackets. Adair XIX, XXIII; Andrew IV [1947 REC]; Atchison IV; Audrain XIX, XXIII; Barry X-Hyslop (1935), XIX, XXIII; Barton IV, XIX; Bates III; Benton XIX; Bollinger XIX, XXIII; Boone [IV-1947-WSC], XIX [1920-U of Mo. & 1933 (TEB)], XXIII; Buchanan III, IV; Butler XIX; Caldwell IV; Callaway XIX, XXIII; Camden X, XIX, XXIII; Cape Girardeau X (Haseman 1919), XIX, XXIII; Carroll IV; Carter X (Haseman 1919), XIX; Cass III, IV, XVII-?, XXX-?; Cedar XIX, XXIII; Chariton X, XIX; Christian XIX, XXIII; Clark III, IV, X, XIX, XXIII; Clay XIX, XXIII; Clinton XXIII; Cole XIX [1946 CFA], XXIII; Cooper XIX, XXIII; Crawford X, XIX, XXIII; Dade X, XIX, XXIII; Dallas XIX, XXIII; Daviess IV; Dekalb IV, XIX; Dent X, XIX, XXIII; Douglas X, XIX, XXIII; Dunklin XIX, XXIII; Franklin X, XIX [1946] [1947-one specimen, probably a straggler?], XXIII; Gentry III; Greene XIX, XXIII; Grundy III, IV, XIX; Harrison III, IV; Henry III, IV, XIX; Hickory X (Haseman 1919), XIX, XXIII; Holt IV; Howard X, XIX, XXIII; Howell X, XIX, XXIII; Iron X, XIX, XXIII; Jackson IV; Jasper XIX, XXIII; Jefferson X, XIX, XXIII [1937]; Johnson III, IV, XXIII; Knox III, X, XIX, XXIII; Laeledge XIX; Lafayette III, IV, XXIII; Lawrence XIX, XXIII; Lewis III, XIX; Lincoln XIX, XXIII; Linn X, XIX, XXIII; Livingston III, XIX; McDonald XIX; Macon III, XIX; Madison XIX; Maries X, XIX, XXIII; Marion III, IV, XIX, XXIII; Mercer III, IV, XXIII; Miller 19, XXIII; Mississippi XXIII; Moniteau XIX; Monroe III, XIX; Montgomery XIX, XXIII; Morgan X, XIX, XXIII; New Madrid XXIII; Newton XIX, XXIII; Oregon XIX, XXIII; Ozark XIX, XXIII; Pemiscot XXIII; Perry X (Haseman 1919), XIX, XXIII [1937]; Pettis XIX, XXIII; Phelps XIX, XXIII; Pike (X Hyslop 1935), XIX [1933 WSC], XXIII; Polk X, XIX, XXIII; Pulaski X, XIX, XXIII; Putnam III, X, XIX, XXIII; Ralls III, X, XIX, XXIII; Randolph III, X, XIX; Ray IV; Reynolds XIX, XXIII; Ripley XIX, XXIII;

St. Charles XIX [1946], XXIII; St. Clair III, XIX, XXIII; Ste. Genevieve X, XIX, [XXIII-1937]; St. Francois X, XIX, XXIII; St. Louis XIX [1907 CLH, 1920 EPM, 1933 EPM, 1946], XXIII [1937]; Saline IV, XIX, XXIII; Schuyler III, XIX, XXIII; Scotland III, XIX, XXIII; Scott X, XXIII, XXIV; Shannon X, XIX; Shelby III, XXIII; Stoddard XIX; Stone XIX, XXIII; Sullivan III, XIX, XXIII; Taney X, XIX, XXIII; Texas XIX, XXIII; Vernon IV; Warren XIX, XXIII; Washington X, XIX, XXIII; Wayne XIX; Webster X, XIX, XXIII; Wright XIX, XXIII.

17. *Melampsalta calliope* (Wlk.). *Cicada parvula*, Say's (1825) synonym of this species, was described with the remark, "Inhabits Missouri." Davis (1918) cited this locality and later (1920) listed a specimen collected in Wright County on June 20, 1873. Our material was swept from fields of low weeds and tall prairie grasses between June 24 and July 20. Carter (EPM), Holt (EHF), Jasper and Jefferson counties.

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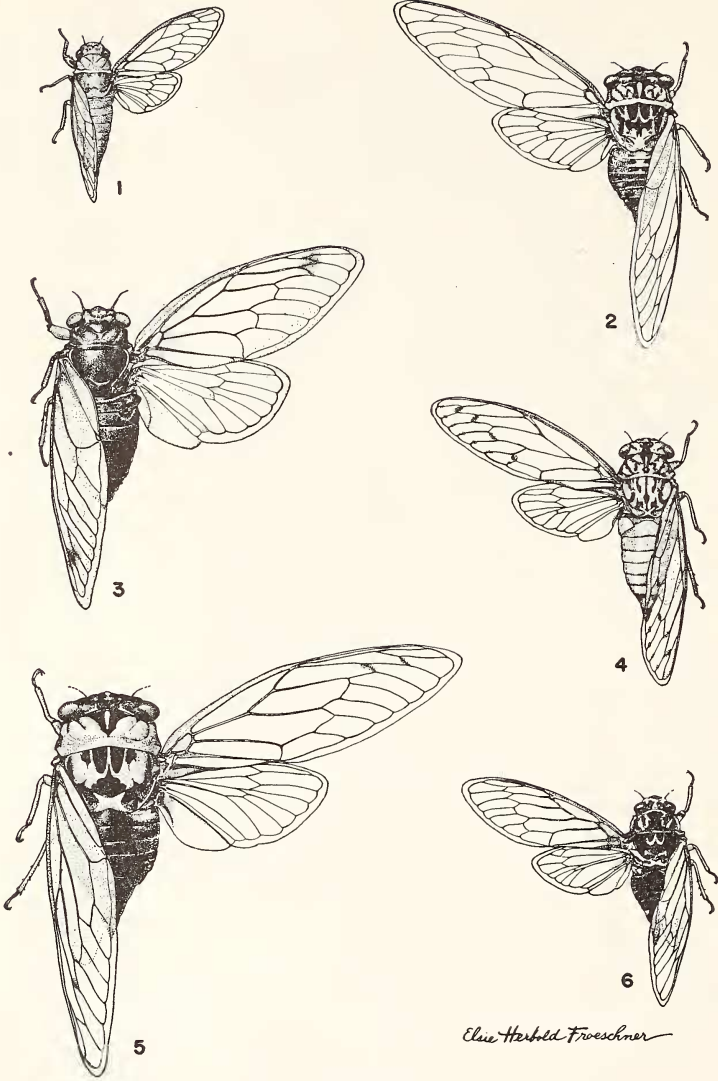


PLATE I

1. *Melampsalta calliope*
2. *Diceroprocta vitripennis*
3. *Magicicada septendecim*
4. *Cicada hieroglyphica*
5. *Tibicen pruinosa*
6. *Okanagana balli*

(All natural size)